

U.S. Rural electrification administration. Cut
ADFO
Add

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration
Washington 25, D.C.

November 7, 1946

To : All Regional Construction Engineers and
REA Field Construction Engineers

From : J. K. O'Shaughnessy, Chief
Engineering Division

Subject: Wood Preservation as it Affects the Life
of REA Distribution Lines

The attached report, Wood Preservation as it Affects the Life
of REA Distribution Lines, was prepared by Mr. F. M. Trimble, 1892 -
Head, Inspection Section, Engineering Division. *red matlock*

The report is a brief summary of the early history of the use
of wood preservatives, pressure and open tank treatments,
structure of pole timber, life of treated and untreated timber,
effects of breaks in the treated layer of timber, the advan-
tages of pole inspection and other information with reference
to treated timber.

It is anticipated that this report will be useful as a source
of information to be presented at conferences and, in general,
as a basis for advice to borrowers on questions on treated
poles and pole inspection.

Samples of treated and untreated timber may be examined at
the office of the Inspection Section in Washington.

Attachment

J. K. O'Shaughnessy

MAY 12 1948



0000
000

Wood Preservation as it Affects the Life
of REA Distribution Lines

When the telegraph and telephone first came into use, requiring the extensive use of poles, there were in this country well distributed virgin stands of cedar of various kinds and chestnut. The abundance of this timber made the cost of poles a minor item. As the transmission of central station power progressed these stands were soon exhausted, making it necessary to use less durable woods in order to obtain volume in production of poles.

Previous to 1900, due to the wealth of forest products in this country, very little was done with wood preservation in America and the little that was done was limited to piling and other installations where the cost of replacement and interruption of service warranted.

During the decade of 1900 to 1910 the knowledge of wood preservation advanced rapidly and was extended to many kinds of material which could not be economically treated before this. This was necessary due to higher cost of timber and was made possible by improvements in the treating processes and equipment of treating plants. It was about this time that the use of the open tank butt-treatment of cedar and chestnut poles was introduced. During the 1920's the eastern cedar forests were largely exhausted and the rapid spread of chestnut blight promised destruction of the native chestnut stands, making it necessary to turn to other species which had a very short life without treatment. The adoption of a coal-tar creosote preservative treatment for poles at this time offset this loss of timber and provided the means of getting longer service from less durable wood poles. Southern yellow pine and Pacific Coast Douglas fir, due to their distribution and the fact that they take certain preservative treatment well, are today supplying approximately 80 percent of the poles used in this country.

There are two methods of treatment now in general use in the country; namely, pressure treatment in a closed cylinder and non-pressure treatment in an open tank. With pressure treatment the airseasoned poles are loaded on trams on a railroad track, and pushed into a cylinder where they are covered by a preservative solution and subjected to pressure of 150 to 175 pounds per square inch. Following exposure at specified temperatures and pressure the excess preservative is then pumped from the cylinder, the door opened and the charge of poles withdrawn. In areas where air-seasoning of poles is not practicable the green poles may be seasoned artificially with steam in the pressure cylinder prior to introduction of the preservative solution.

The other process in common use is known as the open tank process in which no pressure is used. This process is recommended only for airseasoned poles and the amount of penetration obtained depends upon a change in temperature, causing the wood to absorb the

preservative. In this method the entire pole or the butt portion of the pole (as in butt-treatment) is submerged in a hot preservative and held there until the heat has expanded the air in the wood and driven part of it out. Penetration of the wood takes place when the hot preservative is replaced by a cold solution or when the heat is shut off and the poles are permitted to remain in the hot solution until it cools off. The cooling action forms a partial vacuum in the wood and this draws the preservative well into the wood. This process is usually restricted to Western red cedar or to those species having sapwood of a type that readily absorbs preservative.

Pole timber commonly used by REA borrowers contains two distinct kinds of wood; namely, sapwood or the outer light colored portion next to the bark and heartwood or darker colored central core of the trunk. Since the sapwood contains more water and stored plant food, which makes that portion more susceptible to attack by wood-rotting organisms, the object of the preservative treatment of poles is to impregnate this portion to such an extent that wood destroying fungi and termites will not destroy it.

In most species of wood the heartwood is more resistant to decay than the sapwood and also more resistant to the absorption of preservative. When the sapwood is permeated with a preservative and the pole is not subjected to mechanical injuries, exposing the heartwood, a pole will stand almost indefinitely. However, if the heartwood is exposed or if any large amount of sapwood does not receive treatment deterioration will take place at a rate largely determined by current temperature and moisture conditions.

Records upon butt-treated Western red cedar poles indicate that well seasoned poles receiving a penetration of one-half of an inch ($\frac{1}{2}$ ") of coal-tar creosote will give approximately 20 years service in lines north of the Ohio River and west of the Mississippi. We do not get like service however from this species in the warmer and more humid climates. Such species as western larch and lodge-pole pine which have heartwood with little natural resistance to rot must necessarily be restricted to use in semi-arid areas. Good treatment of these latter species is obtainable through proper air-seasoning and incising of the ground line area.

Air-seasoning and incising of the ground line not only insure deeper penetration but also reduce to a minimum checking of the pole surface after treatment. This is vitally important to the life of the poles as the longer moisture is kept from reaching the unprotected heartwood the longer the service life will be. In this same category of precautions we include damage from pole handling tools and lineman's climbing irons. Wherever a tool penetrates through the treated area of wood we have a potential source of rotting with subsequent shortening of the life of the pole.

Excessive checking and damage in handling are not the only sources of pole failures. Rotten or punk-knots, cat faces and

scars often serve as entrance places for fungi. Likewise, green or untreated poles often begin to rot within 30 to 60 days due to adverse weather conditions. Treatment of these poles, as well as those containing defects and injuries, must be preceded by thorough inspection if we are to get poles of the desired life span.

The standards for treatment and inspection of poles for REA very closely follow the accepted standards adopted by the American Wood Preservers' Association who have made studies of all methods and have accumulated service records covering many years experience with all classes of forest products. The incorporation of these basic standards into REA specifications assures REA borrowers that the poles treated under these standards will give good service in the lines.

The REA has set up an inspection service using commercial inspection agencies to make inspection of the poles offered for treatment and the various steps of the treating process, as well as the final results of that treatment, with the object in view of getting full compliance with the specifications. These inspection agencies employ men who are trained in the inspection of materials and treatment. The individual inspectors of these firms must also have the approval of the Inspection Section before they can inspect REA poles. The REA Inspection Section of the Engineering Division now has experienced inspectors in the field checking the commercial inspectors as well as checking the practices of the treating plants.

Records that have been kept over many years, by companies using treated poles, indicate that under average soil and moisture conditions well treated poles will give 25 to 35 years service in the line. These records also show that if the treatment is improperly done the life span of the poles correspondingly reduces with the quality of the treatment. The experiences of the power companies and the telephone and telegraph companies have proven to them that the expense incurred in the employment of capable inspectors is very cheap insurance and is returned many times in length of service. These firms have determined long ago that it is not economical to purchase treated poles without inspection. Most of the producers of treated material welcome inspection and companies objecting to such inspection should be regarded with suspicion.

As was said before, the aim of this inspection service is to get full compliance with the specifications under which the material is produced. This is important because pole failures are very expensive. If improperly treated it is not unusual for poles to fail in a very few years, causing interruption of service, as well as the expense of replacement. There have also been many accidents to line-men due to failure of decayed poles, many of them causing loss of life. This same type of accident has occurred due to defects in the poles before treatment, such as group knots, which weaken a pole so much that it may break through the group of knots when a load is applied.

There has been and still is a good deal of sales effort being expended by some pole suppliers in trying to convince the managers and

engineers of our borrowers that other kinds of treated poles, not included under REA specifications, are as good as or better than those included under our specifications. Such statements are often associated with promises of quick delivery as an added incentive. To the best of our ability we have included in the specifications all products and treatments which give reasonable evidence of being a sound investment. In this selection we have been guided by the experience of those companies that have had long experience in this field and by the advice and suggestion of the Forest Products Laboratory. The Forest Products Laboratory at Madison, Wisconsin has conducted numerous experiments in the treatment of all kinds of timber and has been observing service tests for many years. They are recognized as the best authority on wood preservation in the United States.

There is one more phase of this subject that merits mention at this time, and that is the care used in handling the poles after they are received on the job. Most treated poles consist of an untreated heart center completely surrounded by a layer of treated sapwood of varying thickness. As long as the treated layer is not broken the interior is protected, but if the treated area is broken either by boring an extra hole in the poles or damaged by rough handling or punctured by sharp tools, such as pikes or bars, the opening allows moisture to seep into the interior of the pole and decay develops. Many cases have been observed where an extra bolt hole or injury from tools used in erecting the pole have allowed decay to enter the untreated portion and the decay developed rapidly enough to cause failure of the pole in a very short time. Borrowers should endeavor to get the best treated poles available and then see that the line crews use as much care as possible in handling them so that their life in the line will not be shortened.